

CLAIMS

What is claimed is:

1. An apparatus for use in an automated environment including at least a first automated assembly including components that facilitate an automated process, at least one portable wireless information device (WID) and a controller for controlling the assembly, the apparatus comprising:
 - 5 a first component that is one of the plurality of components and that is linked to the controller to facilitate at least a sub-process associated with the automated process, the first component including at least a first wireless receiver for receiving wireless signals from the at least one WID; and
 - a processor receiving signals from the first receiver and running location
10 determining software for determining the location of the at least one WID as a function of the signals received therefrom.
2. The apparatus of claim 1 wherein the first component is a stationary human-machine interface (HMI) device.
3. The apparatus of claim 2 wherein at least one of the automated assembly components includes a mounting surface accessible within the environment and proximate the automated assembly and wherein the HMI is mounted to the mounting surface.
4. The apparatus of claim 2 wherein the first receiver includes a wireless antenna.
5. The apparatus of claim 2 wherein the HMI includes the processor for determining location.
6. The apparatus of claim 5 wherein the location determining software causes the processor to perform a statistical analysis on the received signals to determine WID location.

7. The apparatus of claim 1 wherein the first component is linked to the controller via a communication network and is also linked to the processor via the communication network.

8. The apparatus of claim 7 wherein the network is an Ethernet network.

9. The apparatus of claim 7 wherein the processor is part of the controller.

10. The apparatus of claim 7 wherein the location determining software causes the processor to perform a statistical analysis on the received signals to determine WID location.

11. The apparatus of claim 1 wherein the first receiver is juxtaposed proximate the automated assembly and wherein the apparatus further includes at least a second receiver positioned at a second location relative to the automated assembly, the second receiver also providing received signals to the processor, the processor determining WID location as a function of the signals received from each of the first and second receivers.

12. The apparatus of claim 11 wherein the environment includes at least a second automated assembly controlled by the controller and including a second plurality of components provided to facilitate an automated process, the apparatus further including at least a second component that is one of the second plurality of components and that is linked to the controller, the second component including the second receiver for receiving signals from the at least one WID and providing the received signals to the processor.

13. The apparatus of claim 12 wherein each of the first and second components are human-machine interfaces (HMIs) and each is linked to the controller via a communication network.

14. The apparatus of claim 13 wherein the processor is embedded within the first HMI and wherein the second HMI is linked to the first HMI via the communication network.

15. The apparatus of claim 14 further including at least a third receiver positioned at a third location relative to the first and second automated assemblies for receiving signals from the at least one WID, the third receiver linked to the processor via the communication network, the processor receiving signals from the first, second and third receivers and using the received signal to determine WID location.

16. The apparatus of claim 14 further including a wireless data system, the data system including a plurality of access points, each access point including a receiver and a transmitter for receiving data from and transmitting data to the at least one WID, respectively.

17. The apparatus of claim 16 wherein at least a sub-set of the access points generates location information and wherein the location information is provided to the processor via the communication network and used by the processor to determine WID location.

18. The apparatus of claim 1 further including a wireless data system linked to the controller for transmitting data to and receiving data from the at least one WID.

19. The apparatus of claim 18 wherein the wireless data system includes data receivers that are separate from the first receiver.

20. The apparatus of claim 19 wherein the data system includes access points, each access point including one of the data receivers and also including a data transmitter, information received by at least a sub-set of the data receivers provided to the processor, the processor using the information from the sub-set of data receivers and the first receiver to determine WID location.

21. The apparatus of claim 20 wherein the first component also includes a first transmitter for transmitting data to the at least one WID.

22. The apparatus of claim 1 wherein the first component includes a transmitter for wirelessly transmitting data.

23. A system comprising:

a controller for controlling an automated assembly;

at least one portable wireless information device (WID) that transmits wireless signals;

5 at least a first automated assembly including a plurality of components that together facilitate an automated process, the plurality of components including a first component linked to the controller to facilitate at least a sub-process associated with the automated process, the first component including a wireless receiver for receiving signals from the at least one WID; and

10 a processor linked to the first component for obtaining signals from the receiver and running location determining software for determining the location of the at least one WID as a function of the received signals.

24. The system of claim 23 wherein the first component is a human-machine interface (HMI).

25. The system of claim 24 wherein at least one of the automated assembly components includes an accessible mounting surface and wherein the HMI is mounted to the mounting surface.

26. The system of claim 24 wherein the HMI includes the processor.

27. The system of claim 23 wherein the location determining software causes the processor to perform at least one of a statistical analysis and a triangulation method on the received signals to determine WID location.

28. The system of claim 24 wherein the first receiver is juxtaposed proximate the automated assembly, the system further including at least a second automated assembly controlled by the controller and including a second plurality of components provided to facilitate a second automated process, the second plurality
5 of components including at least a second component linked to the controller to facilitate at least a sub-process associated with the second assembly, the second component including a second receiver positioned proximate the second assembly, the second receiver providing received signals to the processor, the processor determining WID location as a function of signals received from each of the first and
10 second receivers.

29. The system of claim 34 wherein each of the first and second components are human-machine interfaces (HMIs).

30. The system of claim 29 wherein the processor is embedded within the first component.

31. A location determining assembly for use in an automated environment including at least a first automated assembly including components that facilitate an automated process, at least one portable wireless information device (WID) and a controller for controlling the assembly, the assembly comprising:

- 5 a first human-machine interface (HMI) associated with the first automated assembly and linked to the controller via a communication network for at least one of providing information thereto and receiving information therefrom, the HMI including a first wireless receiver for receiving wireless signals from the at least one WID; and
- 10 a processor receiving signals from the receiver and running location determining software for determining the location of the at least one WID as a function of the signals received therefrom.

32. The assembly of claim 31 wherein the environment further includes at least a second automated assembly controlled by the controller and wherein the assembly further includes a second HMI associated with the second automated assembly and linked to the controller to at least one of provide information thereto
- 5 and receive information therefrom, the second HMI including a second wireless receiver for receiving wireless signals from the at least one WID, the processor receiving signals from each of the first and second receivers and determining WID location as a function of the received signals.

33. The assembly of claim 32 wherein the processor is embedded within the first HMI.

34. The assembly of claim 32 wherein the processor performs at least one of a statistical analysis and a triangulation method on the received signals to determine WID location.

35. The assembly of claim 31 wherein the processor provides WID location determination information to the controller and the controller uses the location information to perform a location dependent function.

36. The assembly of claim 35 wherein the location dependent function includes one of providing location dependent information to the at least one WID and modifying control of the automated assembly.

37. A system for use in an automated environment including at least first and second automated assemblies for performing first and second automated processes, at least one portable wireless information device (WID) and a controller for controlling the assemblies, the system comprising:

- 5 a wireless data communication system linked to the controller and for transmitting data to and receiving data from the at least one WID;
- a first human-machine interface (HMI) linked to the controller to facilitate at least a sub-process associated with the first automated process and including a first receiver for receiving signals from the at least one WID, the first HMI positioned
- 10 proximate the first automated assembly for at least one of providing information related thereto and receiving control instructions there for;
- a second human-machine interface (HMI) linked to the controller to facilitate at least a sub-process associated with the second automated process and including a second receiver for receiving signals from the at least one WID, the second HMI
- 15 positioned proximate the second automated assembly for at least one of providing information related thereto and receiving control instructions there for; and
- a processor receiving signals from the first and second receivers and running location determining software for determining the location of the at least one WID as a function of the signals received therefrom.

38. The system of claim 37 wherein the wireless communication system includes a plurality of access points.

39. The system of claim 37 wherein the processor is embedded in the first HMI.

40. A method for use in an automated environment including at least a first automated assembly, at least one portable wireless information device (WID) and a controller for controlling the assembly, the assembly including a plurality of components provided to facilitate an automated assembly process, the plurality of components including a first component linked to the controller to facilitate an assembly sub-process, the method comprising the steps of:

equipping the first component with a wireless receiver for receiving wireless signals from the at least one WID;

receiving WID signals via the receiver; and

using the received signals to determine WID location.

41. The method of claim 40 wherein the first component is a human machine interface (HMI) and wherein the step of equipping includes embedding the receiver in the HMI.

42. The method of claim 41 wherein at least one of the automated assembly components includes a mounting surface accessible within the environment and proximate the automated assembly and wherein the method further includes the step of mounting the HMI to the mounting surface.

43. The method of claim 41 wherein the step of embedding includes integrating a wireless antenna with the HMI.

44. The method of claim 41 wherein the step of using the received signals includes providing a processor as part of the HMI and using the processor to determine WID location.

45. The method of claim 44 wherein the step of using the processor includes at least one of performing a statistical analysis and a triangulation method on the location information received from the receiver.

46. The method of claim 45 further including the step of receiving additional WID signals via other receivers, providing the other received signals to the processor and performing the statistical analysis on the received WID signals.

47. The method of claim 46 also for use with an existing communication system including communication access points and a network linked to the controller wherein the step of receiving additional WID signals includes receiving additional WID signals from the access points.

48. The method of claim 40 wherein the environment includes at least a second automated assembly controlled by the controller, the second assembly including a plurality of components provided to facilitate a second automated assembly process, the plurality of components including a second component linked
5 to the controller to facilitate an assembly sub-process, the method further including equipping the second component with a second receiver for receiving WID signals, the step of receiving including receiving signals from each of the first and second receivers and the step of using the received signals to determine WID location including using the signals from each of the first and second receivers.

49. The method of claim 40 wherein the step of using includes performing at least one of a statistical analysis and a triangulation method on the received signals to determine WID location.

50. The method of claim 40 wherein the step of using includes providing a processor, linking the processor to the first component via a communication network, transmitting the receiver signals via the communication network to the processor and performing an algorithm via the processor to determine WID location.

51. The method of claim 50 further including the step of linking additional receivers to the processor, obtaining additional WID signals via the additional receivers and providing the additional WID signals to the processor via the communication network, the step of using further including using at least a sub-set of
5 the signals received from each of the receivers to determine WID location.

52. The method of claim 40 wherein the step of equipping includes providing a port on the first component for receiving a linkage, providing an antenna, mounting the antenna and linking the antenna to the first component port via a linkage.

53. The method of claim 52 wherein the first component is a stationary human-machine interface (HMI) device.

54. A system for use in an automated environment including a plurality of automated assemblies, each assembly including components that facilitate automated processes and at least one portable wireless information device (WID), the system comprising:

- 5 at least a first processor;
- a set of communication access points configured to receive signals from, and transmit signals to, the WID;
- a set of wireless receivers, each wireless receiver integrated with a different component from a first sub-set of the assembly components and configured to
- 10 receive signals from the WID; and
- at least a first communication network linking at least a sub-set of the first sub-set component to the at least one processor and also linking each access point to the at least one processor, the at least one processor obtaining WID signals from each of the receivers and also at least one of transmitting signals to, and receiving
- 15 signals from, each of the first sub-set assembly components, via the at least a first network.

55. The system of claim 54 wherein at least a sub-set of the first sub-set of the assembly components includes human-machine interfaces (HMI).

56. The system of claim 54 wherein the at least one processor both transmits signals to and receives signals from at least a sub-set of the first sub-set of assembly components via the network.

57. The system of claim 54 wherein the at least one processor uses the obtained WID signals to determine WID location.

58. The system of claim 57 wherein the processor also uses WID signals received from at least a sub-set of the communication access points to determine WID location.

59. The system of claim 54 wherein the at least one processor includes at least a first processor linked via the at least a first network to the access points and at least a second processor linked via the at least a first network to the first sub-set of assembly components and wherein the at least a first network links the first and
5 second processors together.

60. The system of claim 59 wherein the first sub-set of assembly components includes a first component and wherein the second processor is integrated into the first component.

61. The system of claim 60 wherein at least the first component is a human-machine interface (HMI).

62. The system of claim 59 wherein the at least a first network includes at least a first network that links the communication access points to the first processor and at least a second network that links the first sub-set assembly components to the second processor.

63. The system of claim 54 wherein the at least a first processor is remotely located from the first sub-set assembly components.

64. A method for use in an automated environment including a plurality of automated assemblies, at least one portable wireless information device (WID) and at least one controller for controlling the assemblies, each assembly including a plurality of components provided to facilitate an automated assembly process, at least a first sub-set of the assembly components linked to the controller to at least one of provide signals thereto or receive signals therefrom, the method comprising the steps of:

equipping at least a sub-set of the first sub-set of assembly components with wireless receivers for receiving wireless signals from the at least one WID;

receiving WID signals via the receivers; and

using at least a sub-set of the received signals to determine WID location.

65. The method of claim 64 wherein at least a sub-set of the first sub-set includes human-machine interfaces and wherein the step of equipping includes embedding receivers in the assembly components.

66. A system for use in an automated environment including at least a first automated assembly including components that facilitate an automated process, the system comprising:

- at least a first wireless information device (WID) including a transceiver and a first processor;

- a first component that is one of the plurality of components that is linked to the controller to facilitate at least a sub-process associated with the automated process, the first component including at least a first wireless transmitter for transmitting wireless signals to the at least one WID;

- at least one receiver; and

- at least a second processor linked to the first component and to the at least one receiver, the at least a second processor running a program to determine WID position as a function of signal strength data generated by the transmitter and the WID;

wherein, the at least a first transmitter transmits signals of known signal strength to the WID, the WID determines signal strengths and transmits signal strength data to the at least one receiver and the at least a second processor obtains the signal strength data from the at least one receiver and uses the obtained data to determine WID position.

67. The system of claim 66 wherein the at least a first component includes a plurality of components, each of the plurality including a separate transmitter and, wherein, the WID receives signals from at least a sub-set of the transmitters, determines signal strength and transmits the signal strength data to the receiver.

68. The system of claim 66 wherein the at least one receiver is separate from the at least one component.

69. The system of claim 68 wherein the at least one receiver is a communication access point that is part of a wireless communication network.

70. The system of claim 66 wherein the at least one component is a human-machine interface.